coefficients for buyer size each represent the direction and magnitude by which the affiliate fees negotiated by that buyer differs from the affiliate fees negotiated by the buyer that serves 51% of the MVPD market when both buyers negotiate with the most popular **seller.** The t-statistics associated with each estimated coefficient examines whether this difference is statistically significant. For example, the statistical significance of the coefficient on the dummy variable "7%" indicates that the most popular seller (i.e., Seller **#4)** receives a higher affiliate fee (per subscriber) when conducting a trade with **a** buyer that serves 7% of the market than when conducting a trade with a buyer that serves 51% of the market.[63] Similarly, the statistical significance of the coefficient on the dummy variable "44%" indicates that the most popular seller receives a higher affiliate fee (per subscriber) when conducting a trade with a buyer that serves **44%** of the market than when conducting a trade with a buyer that serves 51% of the market.[64]

The regression also shows some other interesting results. For example, the statistical significance of the coefficient on the dummy variable **"Seller** #2" indicates that the largest buyer, which serves 51% of the MVPD market, pays a lower affiliate fee (per subscriber) when trading with Seller #2 than when trading with Seller **#4.** In addition, the statistical significance of the coefficient on the dummy variable "Seller **#3"** indicates that such a buyer pays a lower affiliate fee (per subscriber) when trading with Seller #3 than when trading with Seller #4.[65] These and the preceding results indicate that, to some degree, the favorableness of an affiliate deal depends, in part, on the size of the participant.[66] Specifically, it indicates that large buyers negotiate lower affiliate fees than small buyers when negotiating with a large seller.[67] In addition, more popular

[63] The coefficient on the dummy variable "7%' identifies the "premium" that a buyer that serves **7%** of the MVPD market pays above the affiliate fee paid by a buyer that serves **51%** of the same market when conducting a trade with the largest seller.

[64] One might expect that the size of the coefficients associated with the different dummy variables should decrease monotonically. The absence of this relationship among the estimated coefficients suggests that the importance of **a** buyer's size may depend, in part, on the size of the other buyers.

[65] Given the size of the t-statistic associated with the Seller #3 dummy variable (-2.25) and the absence of a normally distributed error term, the statistical strength of this result may be less than the strength demanded under conventional levels of acceptance.

[66] The statement was qualified because we have not completed all of the relevant statistical tests.

[67] Many other hypotheses can be tested. For example, does a large buyer have an advantage over a small buyer when negotiating with a moderately popular programming network? See J. Johnston, Econometric

programming networks appear to obtain higher affiliate fees than less popular programming networks when negotiating with a large buyer. These results indicate that buyers and **sellers** both have the incentive to become larger.

Table **17** also contains a regression that explores whether there is a statistically significant difference in the license fees [per subscriber) paid by buyers across concentration treatments.[68] The model includes a set of dummy variables for two of the analyzed concentration treatments and for three of the **sellers.** For example, the dummy variable "High/Low" takes on the value of one when a trade occurs in a market that includes two major cable operators (i.e., market shares of **44%** and **39%)** and one DBS operator, zero otherwise. Similarly, the dummy variable "High/High" takes on the value of one when a trade occurs in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers, zero otherwise. In this model, the constant term captures the effect of the Low/High concentration treatment. In this treatment, the market is served by two "moderately-sized" cable operators (i.e., market shares of **27%** and **24%)** and several smaller buyers. The constant term also captures the effect on the affiliate fee when a buyer trades with the most popular seller (i.e., **Seller** #4).

The coefficient on the "High/Low" dummy variable measures the difference in the effect of this concentration treatment on the affiliate fee (per subscriber) paid by buyers when completing a trade with the most popular **seller,** compared with the affiliate fee (per subscriber) paid by buyers when trading with the same seller in the Low/High concentration treatment. Similarly, the coefficient on the "High/High" dummy variable measures the difference in the effect of this concentration treatment on the affiliate fee (per subscriber) paid by buyers when completing a trade with the most popular seller, compared with the affiliate fee (per subscriber) paid by buyers when trading with the same seller **in** the Low/High concentration treatment.

Methods 179 **(1972) for a general discussion of how to test different hypotheses in the presence of a dummy variable model.**

[68] **A model specification that included both the market concentration and buyer size dummy variables generated "multicollinearity" problem.**

The statistical significance and sign of the coefficient on the "High/Low" dummy variable indicates that buyers pay a lower affiliate fee (per subscriber) when operating in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS operator than when operating in a market that is served by two "moderately-sized" cable operators (i.e., market shares of 27% and 24%) and several smaller buyers.[69] The statistical insignificance of the coefficient on the dummy variable "High/High" indicates that buyers pay, on average, the same affiliate fee (per subscriber) when operating in market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers than when operating in a market that is served by two "moderately-sized" cable operators (i.e., market shares Of 27% and 24%) and several smaller buyers. Taken together, these results indicate that while the most popular seller may be indifferent between a market that includes a single large buyer with a 51% market share and several substantially smaller buyers and a market that includes two "moderately-sized" cable operators (i.e., market shares of 27% and 24%) and several smaller buyers, it prefers these two market environments over one that includes two major cable operators (i.e., market shares of 44% and **39%)** and one DBS operator.

Tables 18-21 presents regression results that explore the determinants of the variations in the net surplus earned by the different sellers. Net surplus measures the profits or losses earned/incurred by a seller during trading periods 5-8 within a given experimental session. These regressions were run to determine whether sellers varied in their ability to operate profitably in the various concentration treatments.[70]

[69] Given the size of the t-statistic associated with the High/Low dummy variable (-2.28) and the absence of a normally distributed error term, the statistical strength of this result may be less than the strength demanded under conventional levels of acceptance.

[70] All regressions use an estimator that corrected the bias in the standard errors of the estimated coefficients resulting from heteroscedasticity. In the regressions that employ Seller #1 Net Surplus and Seller #2 Net Surplus as dependent variables, a Shapirc-Wilkes test accepts the null hypothesis that the regression error term is normally distributed. The same test rejected the normality of the error terms in the regressions that employed Seller #3 Net Surplus and Seller #4 Net Surplus as dependent variables.

Observations = 24		R^2 = .3338	
$F(3, 20)$ = 3.26		Root MSE	
Prob > F = 0.04		36.96	
Seller #1 Net Surplus	Coefficient (t-value)	(95% Confidence Interval)	
Low/High	-48.75 (-2.22)	-94.51	-2.98
High/High	-59.50 (-2.93)	-101.90	-17.07
Period	-5.46 (-.81)	-19.55	8.62
Constant	-70.71 (-1.46)	-171.80	30.46

Table 18: Seller #1 Net Surplus Regression (*CAP*MFN Treatment)

Observations = 24		R^2 = .3054	
$F(3, 20)$ = 1.90		Root MSE	
Prob > F = 0.1622		19.382	
Seller #2 Net Surplus	Coefficient (t-value)	(95% Confidence Interval)	
Low/High	-21.25 (-1.91)	-44.41	1.91
High/High	-26.25 (-2.36)	-49 45	-3.04
Period	-2.55 (-.57)	-1 1.95	6.85
Constant	-98.71 (-2.79)	-172.35	-24.74

Table 19: Seller #2 Net Surplus Regression (*CAP*MFN Treatment)

In Tables 18 and 19, the negative regression coefficients indicate that **Sellers** #1 and #2 lose money in all treatments. The statistical significance of and sign on the coefficient on the dummy variable "Low/High" indicates that these **sellers** incur greater losses operating in a market that includes two "moderately-sized" cable operators (i.e., market shares of 27% and **24%)** and several smaller buyers than in a market that includes two major cable operators (i.e., market shares of **44%** and **39%)** and one DBS service provider." The statistical significance and sign of the coefficient on the **dummy** variable "High/High" indicates that **Sellers** #1 and #2 incur greater losses operating in a market that includes a single large cable operator (i.e., market share **51%)** and several substantially smaller buyers, than in a market that includes two major cable operators (i.e., market shares of 44% and **39%)** and one DBS service provider. According to the estimated coefficients. Sellers #1 and #2 incur the highest losses in a market that includes a single large cable operator (i.e., market share **51%)** and several substantially smaller buyers.

Table **20** reports regression results on the net surplus of the "moderately" popular **seller** (i.e., Seller #3).

[71] **Given the size** of **the t-statistic associated with the Low/High dummy variable (-2.22) and the absence** of **a normally distributed error term, the statistical strength** of **this result may be less than the strength demanded under conventional levels** of **acceptance.**

Observations = 24		R² = .1539	
F(3, 20) = 2.14		Root MSE =	
Prob > F = 0.1275		183.98	
Seller #3 Net Surplus	Coefficient (t Value)	(95% Confidence Interval)	
Low/High	**172.12 (1.98)**	**-9.20**	**353. 45**
High/High	**56.87 (.51)**	**-177 02**	**290.77**
Period	**-1.85 (-.05)**	**-79.89**	**76.19**
Constant	**-122.35 (-.54)**	**-598.60**	**353.90**

Table **20: Seller #3 Net Surplus Regression**
***(CAP* MFN Treatment)**

The statistical insignificance of the coefficient on the dummy variable "High/High" indicates that **Seller** #3 **earns** the same net surplus operating in a market that includes a single large cable operator (i.e., market share **51%)** and several substantially smaller buyers, than in a market that includes two major cable operators (i.e., market shares of **44%** and 39%) and one DBS service provider. The statistical significance of the coefficient on the dummy variable "Low/High" indicates that **Seller** #3 earns higher net surplus operating in a market that includes two "moderately-sized cable operators (i.e., market shares of **27%** and **24%)** and several smaller buyers than in a market that includes two major cable operators (i.e., market shares of **44%** and 39%) and one DBS service provider." Unlike in the other two market environments, **Seller** #3 would earn a positive net surplus (i.e., profits) operating in **a** market that includes two "moderately-sized cable operators (i.e., market shares of **22%** and **24%)** and several smaller buyers.

[72] **Given the size of the t-statistic associated with the Low/High dummy variable (1.98) and the absence of a normally distributed error term, the statistical strength of this result may be less than the strength demanded under conventional levels of acceptance.**

Thus, in contrast to the two **least** popular sellers, there does exist a market environment in which **Seller** #3 **earns** a profit.

Observations = 24 F(3, 20) = .2[illegible] Prob > F = 0.8441		R^2 = .0410 Root MSE = 947.22	
Seller #3 Net Surplus	Coefficient (t-value)	(95% Confidence Interval)	
Low/High	**-422.50 (-.77)**	**-1574**	**729**
High/High	**-247.25 (-.76)**	**-929**	**435**
Period	**-38.86 (-.34)**	**-276**	**198**
Constant	**1971.122 (2.32)**	**199**	**3742**

Table 21: Seller #4 Net Surplus Regression
(CAP **MFN Treatment)**

The statistical insignificance of the coefficient on the dummy variable "Low/High" indicates that **Seller** #4 earns as much profit operating in a market that includes two "moderately-sized" cable operators (i.e., market shares of **27%** and **24%)** and several smaller buyers than in a market that includes two major cable operators (i.e., market shares of **44%** and **39%)** and one **DBS** service provider. Similarly, the statistical insignificance of the coefficient on the dummy variable "High/High" indicates **Seller** #4 earns as much profits operating in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers than in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS service provider. Thus, according to the regression model, **Seller** #4's financial payoff does not vary significantly over the range of horizontal concentrations considered in this analysis.

5.0 Concluding Comments

In this paper we have reported on the results of a series of experiments designed to shed light on the impact of horizontal concentration among cable operators in markets in which cable operators (and a DBS operator) purchase programming packages from **a** set of suppliers. Our principle conclusions are **as** follows.

First, when the number of programming networks exceeds the cable operator's channel capacity, higher levels of horizontal concentration (holding the number of buyers constant) led to a modest reduction in "economic efficiency." In the current context, a reduction in economic efficiency indicates that fewer or socially **less** desirable trades occurred in the more concentrated market structure than in the **less** concentrated market structure. Second, the experimental results indicate that in the experimental economics setting the bargaining power of a cable operator that **serves** 27% of the MVPD market does not differ substantially from the bargaining power of a cable operator that **serves** 51% of the MVPD market. From the perspective of a programming network, a cable operator that serves 27% of the MVPD market is as powerful as one that **serves** 51% of the market. Thud, the experimental results indicate that there is a statistically significant decrease in the DBS operator's bargaining power when two cable operators **serve 44%** and **39%** of the MVPD market, than when the largest cable operator **serves** 27% of the MVPD market. **A** reduction in its bargaining power means that the DBS operator can expect to pay higher affiliate fees following the increase in horizontal concentration. Fourth, the results indicate that **sellers** representing the least popular programming networks had difficulty earning a profit (i.e., conducting a series of trades that allowed them to more than cover their costs) in each of the horizontal concentration environments considered.

Additional experiments were conducted to explore the effects of two institutional features of the market environment. One set of experiments relaxed the assumption that buyers have limited channel capacity. Where a channel capacity constraint did not exist all sellers were consistently able to conduct a set of trades thar enabled them to earn a profit. Consistent with this outcome. sellers' bargaining power increased while buyers' bargaining power declined. Experiments were also conducted to explore the effect of a large cable operator's ability to successfully include a "Most Favored Nation" ("MFN") provision in an affiliate agreement. The existence of an MFN provision substantially increases the bargaining power possessed by buyers. In addition, when negotiating with a popular programming network, large cable operators are able to negotiate lower affiliate fees, expressed on a per subscriber basis. than small buyers (i.e., cable operators and DBS providers). A programming network's ability to negotiate a high affiliate fee with a large buyer depends on the popularity of the programming network. The more popular the programming network, the higher the affiliate fee. These results indicate that both buyers and sellers have an incentive, based solely on the expected changes in negotiated affiliate fees, to grow larger.

An attempt was made to include in the experimental market those features of the actual market that have an important impact on the affiliate agreements negotiated between programming networks and MVPDs. However, the experimental market did not and could not display all the complex characteristics of the actual market. For example, the experimental market includes far few programming networks and MVPDs than there are in the actual market. In particular. the experimental market does not take into account that there are multiple DBS service providers. The experimental market also does not take into account that some large cable operators have attributable interests in programming networks (i.e., vertical integration). While the issue of vertical integration is a potentially significant institutional feature that subsequent analyses may be able to consider, we chose not to account for it because of the already complex nature of the experimental design.

The experiments do not include subjects that play the role of advertisers or advertising agencies ("advertisers"). While they are not explicitly included in the experiments, the presence of advertisers is felt through a set of assumptions regarding the price at which advertising time is sold. For example, the analysis assumes that the price of national advertising time is independent of the size of the cable operator. It is possible that this assumption is not satisfied when a cable operator becomes very large. Because of cost effectiveness and superior ratings measurement considerations, national advertisers acquire cable advertising time directly from programming networks. However, their willingness to buy advertising time from cable operators may increase substantially as cable operators become larger. This increased willingness may lead to a reduction in the advertising revenue earned by programming networks. Unless this reduction in revenue is offset by an increase in the affiliate fees paid to it by the cable operator, the cable network can expect to **earn** less revenue and, thus, be adversely affected by an increase in the size of the cable operator. By not including this potentially important effect, the economic experiments may understate the economic effect on programming networks of an increase in horizontal concentration among cable operators.

The experiments did not take into account other institutional factors that may have bearing on the outcome of the bargaining game between programming networks and buyers. For example, the economic experiments may not fully capture the possibility that the bargaining outcomes in successive trading periods in the actual market may be correlated. Indeed, programming networks may have increased bargaining power in the future if a MVPD presently carries them. This increased bargaining power may be due to the dissatisfaction MVPD subscribers may experience from having a previously carried programming network dropped by the MVPD.[73]

The experiments impose the restriction that the value a particular buyer (e.g., cable operator) places on a particular programming network is independent of the carriage decisions made by another MVPD (e.g., DBS). In the actual market, a large buyer's decision not to carry a programming network may affect the quality of the programming offered by the programming network. Such an effect would violate the restriction that a buyer's valuation for a programming network is independent of the carriage decisions made by other buyers. Similarly, the experiments impose the restriction that the value a particular MVPD places on a given programming network is independent of the types of programming networks the MVPD decides to cany. In the actual market, MVPDs have an incentive to carry a package of programming networks that maximizes their subscription and local advertising revenues. Under such packaging, the value MVPDs place on a given programming network depends, in part, on the types

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[73] **However, while the resulting sense of customer dissatisfaction may enhance a currently carried programming network's bargaining power. it may reduce the relative bargaining power of those programming networks that are currently not carried.**

of programming networks they decide to carry. The experiments also impose the restriction that the subscription price charged by the MVPD is independent of the carriage decisions made by another MVPD and, in the instance where the MVPD decides to cany that programming network, the level of the affiliate fee paid by that MVPD. Such independence may not be observed in the actual market.

Finally, substantial effort was made to assign buyers' willingness to pay for programming networks that parallel the values they possess in the actual market. Similar care was given to the assignment of other important parameters, such as costs and, for sellers, the level of national advertising revenue they would earn from conducting a trade with a given buyer. While some may quibble with the values assigned to the subjects, the important issue is whether the assigned values affected the results of the analysis. It is worth noting that the results of the analysis are expressed almost entirely in terms of how a change in some feature of the market could affect the bargaining outcome as measured by a specific performance measure. Such an approach minimizes the importance of the assumptions used to construct the willingness to pay, national advertising revenue, and cost parameters that were assigned to subjects.

Appendix A: Economic Theory

In this appendix we review the relevant economic theories of bargaining processes. After initially concluding that traditional oligopoly and oligopsony approaches are not relevant to the bargaining situation between cable operators and programming networks, we focus on three solution concepts to bargaining games found in cooperative game theory. **We** then apply these solution concepts to the bargaining game in which cable networks and cable operators participate and provide a set of limited conclusions.[74]

A.1 Traditional Oligopsony/Oligopoly Theory

Traditional economic theory analyzes the **role** of horizontal concentration as an exercise in which "players" simultaneously and independently make decisions regarding either how much to **sell** or how much to buy. If concentration on the **sell** side of the market is of concern, the buy side is assumed to be passive, with a downward sloping demand curve expressing the marginal willingness to pay for any given total quantity offered for sale in the market." If a set of identical **sellers** with constant marginal costs are assumed to behave strategically, then the symmetric Cournot-Nash equilibrium determines the market price, and therefore the excess of price over marginal cost.[76] In the Cournot-Nash equilibrium the market price declines and converges to marginal cost as the number of **sellers** increases. This result demonstrates an unambiguously adverse consequence of concentration on the sell side, measured in terms of both economic efficiency and the welfare of the buy side. If concentration on the buy side of the market is of concern, and **sellers** are assumed to behave passively (via an upward sloping supply schedule representing the average cost of supplying a given total market quantity), an oligopsony equilibrium exists, where the total quantity purchased is **less** than the efficient quantity, but approaches the latter as the number of buyers increases. In this case,

[14] Cooperative game theory assumes that players have the ability to make binding commitments to behave in a certain way and that they attempt to coordinate with other players in order to maximize their respective payoffs given the strategies adopted by other players. Because of this attempt to coordinate with other players. the unit of analysis in cooperative game theory is typically a group or "coalition."

[75] Buyers behave "passively" when, as a group, they simply behave as "price takers."

[76] The term "strategic" refers to the decision each seller makes to restrict its output in an attempt to maximize its profits.

concentration on the buy side again has an unambiguously adverse consequence for both economic efficiency and welfare of the **sell** side.

While the models of oligopoly and oligopsony are familiar to all economists, neither of these approaches provides a suitable basis upon which to analyze the current market in which programming networks conduct trades with cable operators. Consider the oligopsony model. The current market involves a set of sellers offering for sale a set of differentiated products.[77] In contrast to the standard oligopsony model, the popularity of some cable networks may enable them to have a substantial say in the price at which they license their package of programs to cable operators.” The traditional oligopoly model is equally inapplicable. The current market includes a set of buyers that have a large position in the market for the provision of multi-channel video service to the home in their respective franchise areas. The near exclusiveness of their franchises provides cable operators the opportunity to act in a non-passive, strategic manner, contrary to the assumption regarding buyers contained in standard oligopoly theory.[79] Thus. each side of the market has both the opportunity and the incentive to behave strategically with respect to other members of its side of the market. For example, each cable operator has the incentive to minimize the affiliate fees it pays to programming networks, while attempting to increase the affiliate fees paid by other cable operators. Likewise, each cable network has the incentive to maximize its own national advertising revenue.

A.2 Some Solutions Based on Cooperative Game Theory

The formal models of oligopoly and oligopsony are examples of very simple non-cooperative games, in which players are assumed to make strategic decisions by taking account of the strategies of other players in the game. An alternative game theoretic approach, known as cooperative game theory, takes a somewhat different approach to the

[77] Programming networks are differentiated in that a cable operator does not value all programming networks equally

[18] The popularity of some of programming networks may provide them substantial bargaining power aver cable operators.

[79] Some claim that, because of changes in the MVPD marketplace. cable operators have little incentive to harm cable networks. This claim rests on the notion that DBS, despite serving approximately 17% of the MVPD universe, provides a method of distribution that is a close substitute to cable distribution. See Statement of Howard A. Shelanski (“Shelanski”), Attachment to Comments and Petition for Rulemaking of the National Cable and Telecommunications Association, filed January 4, 2002.

underlying strategic considerations. Rather than modeling in detail the individual decisions that could be made by individual players. the cooperative approach seeks to define the "value" that each coalition of players can achieve, and then draw conclusions regarding the distribution of the total value among the members of the coalition." Cooperative game theory can therefore be used to frame and improve our economic understanding of market environments without the need to model in detail the strategies of individual players. Neither a cooperative game theoretic nor a non-cooperative game theoretic approach is able to incorporate many of the features that are likely to have an important effect on the outcome of the bargaining game that occurs between cable networks and cable operators.

Consequently, substantial care must be taken in interpreting the conclusions of this section. **We** examine three cooperative solution concepts that can be applied to the bargaining game that occur between cable operators and cable networks. The first solution concept is the "Nash Bargaining Solution," which is defined as the solution to the bargaining game between two players that maximizes the product of the gains enjoyed by both parties over the payoff earned by each when they do not trade.[81] The second solution concept is the "Shapley Value," which measures what each player could reasonably expect to receive as his/her share of the reward in a more general cooperative game. **A** third solution concept is the "Core," which defines a range of bargaining outcomes for the buyers and the **sellers** that no coalition can improve upon.[82]

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[80] The bargaining process between MVPDs and programming networks is an example of a class of cooperative games known as "market games" that have been extensively studied in the literature. See, **e.g.** G. Owen **(1982),** ***Game Theory.*** Cambridge, MA: Academic Press: and M. Shubik **(1982).** ***Game Theory in the Social Sciences,*** Cambridge, MA MIT Ress for standard references. In a simple market game the value of a coalition is defined as the maximum possible **surplus** resulting from trades between buyers and sellers, afler subtracting all relevant costs.

[81] In a paper closely related to this one, David Waterman argues that in a bargaining model in which upstream suppliers (e.g., network programmers) sell to a downstream retail sector (e.g., MVPDs), the retail sector may be able to exert monopsony power by forming coalitions. [D. Waterman (1996), "Local Monopsony and Free Riders," ***Information Economics and Policy, 8,*** pp. 337-55]. See also T. Chipty and C.M. Snyder **(1999),** "The Role of Firm Size in Bilateral Bargaining: A Study of the Cable Television Industry," ***Review of Economics and Sraristics, 81,*** pp. **326-40.**

A.2.1 The "Nash Bargaining" Solution

The most straightforward bargaining problem can be represented as a "divide-the-surplus" game in which two parties bargain over the division of a known prize or surplus (e.g., gains from trade). If the parties reach an agreement about the division of surplus. they are entitled to keep their respective share. Based upon a set of "reasonable" and very general axioms (or assumptions), John Nash[83] was able to both generalize this simple situation and derive a solution concept that provides a precise solution to the bargaining game.[84] The Nash Bargaining solution attempts to identify a payoff for each player that is both "fair" and "efficient." In the present context, "fairness" is defined by a symmetry axiom, under which the parties agree to equally divide the surplus available from trade. ''Efficiency" involves maximizing the sum of payoffs.

Under the Nash Bargaining solution, the outcome of the bargaining process is allowed to depend on the outside options available to each party, otherwise known as "disagreement outcomes."[85] For example, if two parties are bargaining over a dollar, and one party could secure 20 cents if negotiations fail, while the other party could secure 30 cents if negotiations fail, then only 50 cents (1 dollar minus 20 **cents** minus **30** cents) is at stake in the negotiations. Applying the equal division logic to this amount, the final bargaining outcome would be 45 cents and *55* cents, respectively, for the two parties.[86]

A.2.2 The "Shapley Value" Solution

The Shapley Value seeks to define what each player could reasonably expect to receive as his/her share of the reward when the coalition of all players (sometimes called

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[81] **A** competitive equilibrium, when it exists, is always contained in the Cwe, and under **some** circumstances the Core converges to the competitive equilibrium as the number of players becomes large.

[83] This is the same Nash responsible for the Nash equilibrium concept referred to previously, but the Nash Bargaining Solution is a solution in cooperative game theory, while the Nash equilibrium is a fundamental solution concept in non-cooperative **game** theory.

[84] More specifically, Nash was able to restrict the set ofpossible bargaining outcomes by requiring that the equilibrium satisfy a set of axioms.

[85] In the current context, the notion of a disagreement outcome allows one to take into account the existence of the costs that have been incurred by cable networks **and** cable operators prior to entering into the market.

[86] The Nash Bargaining Solution concept can also be employed where the bargaining game is not "symmetric." In such a situation, the disagreement payoffs are not the same across the two players and the **set** of possible payoffs to the players may be unequal (i.e., asymmetric). In such cases, the **Nash** Bargaining Solution considers a "weighted" or generalized bargaining solution, where each party's inherent bargaining power is determined by external factors.

the grand coalition) forms.” However, in contrast to the Nash Bargaining Solution, the Shapley Value **takes** account of all coalitions smaller than the grand coalition that could form.’’ As both a standard of fairness and a description of the way that bargains are decided, the Shapley Value assumes that players are entitled to their expected incremental contribution to the surplus.[89] In any given ordering of players, a player’s incremental contribution to the game depends on the identities ofplayers who are already present.” Hence a player’s expected incremental contribution is just the average incremental contribution which that player makes to the coalitions that it joins, over all possible orderings of players.

A.2.3 The “Core” Solution

The **Core** is based on the assumption that players can costlessly form coalitions and that members of each coalition can negotiate their share of the surplus available to members of that coalition. In negotiating its share, each member, or a set of members of the coalition, evaluates whether it could do better if it joined another coalition. The **Core** defines that set of payoffs such that no individual or group of individuals can improve their position by forming an alternative coalition.” In the current context, the **Core** is the set of surpluses earned by cable networks and cable operators such that **no** individual cable network or cable operator can improve its welfare by joining and trading with members of another coalition.[92]

[87] The Shapley Value. like the Nash Bargaining Solution, has been defined by means of a set of plausible axioms or characteristics that an imposed equilibrium, such as an arbitrated outcome, ought to possess.

[88] The Nash Bargaining Solution applies only to pair-wise bargains between players, and does not consider interactions among other coalitions.

[89] If $v(S)$ represents the value of a coalition S then the incremental contribution of a player i to the coalition S is given by $v(S \cup i) - v(S)$.

[90] For example, if there are three players, then in the ordering 1,2,3, player 1's incremental contribution is the value that player 1 can achieve by itself; player 2's incremental contribution is the value achieved by 1 and 2 together minus the value achieved by player 1 in isolation; and player 3's incremental contribution is the value of 1,2, and 3 minus the value achieved by 1 and 2.

[91] The Core is a widely used concept in the analysis of competitive equilibrium in the production of private goods. However, it also has relevance in trading situations involving small numbers of buyers and/or sellers. For example, in a simple bilateral bargaining model, the set of core allocations is that segment of the contract curve lying within the region in which both players are at least as well off as they would be if they did not trade.

[92] The Core is defined with respect to a characteristic function representation of the trading situation in which the value of any coalition of buyers and sellers is equal to the maximum gains from trade, subject to the capacity constraints that exist in the market.

Under the Core, every player or coalition of players is guaranteed a payoff that is at least as high as the payoff it would have received had it been a member of a smaller coalition. Moreover, in a market game involving trades between buyers and sellers, an increase in the number of traders of one type (e.g. sellers) tends to reduce the payoffs to traders of that type while increasing payoffs to traders of the opposite type." In a market game, there are typically many allocations that are consistent with the Core.[94] Thus, in the current context, there are numerous allocations of surpluses among cable operators and cable networks that will satisfy the requirements of the Core.

A.3 Illustration of the Cooperative Solutions for a Symmetric Bargaining Game

As explained in Section 3.1, our experimental analysis focused largely on a specific "treatment variable" in which each MVPD is constrained in the number of programming networks that it can carry and in which the costs for both buyers and sellers are treated as unavoidable.[95] In order to gain additional insights on the relevant features of the market in which programming networks and cable operators negotiate affiliate agreements we examine carefully the cooperative game solutions defined in Section **A.2** under all possible combinations of the treatment variables. We illustrate these solutions in an environment where there are four identical buyers and four identical sellers. The value of a trade between any buyer and any seller is assumed to be 10. Buyers do not have any costs and each seller has a cost of **20.** The payoffs to a representative buyer and a representative seller in each of our four treatments are shown in Table **A.1**.

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[93] Intuitively, an increase in the number of sellers gives buyers more alternatives, but may also increase the competition among sellers to trade with a given buyer.
[94] However, it has been shown that the set of Core outcomes shrink; as the number players increases, and in the limit as the number of traders goes to infinity, the Core converges to the competitive equilibrium. See, e.g., Owen (1982, p. 181-5).
[95] A limited number of experiments were done assuming no **capacity constraint** on **buyer purchases. We did not attempt to experimentally test the case of avoidable costs.**

Treatment	Payoff = (Sellers, Buyers)			
	Nash Bargaining Solution	Shapley Value	Best Core Outcome for Buyers	Best Core Outcome for Sellers
Avoidable Cost, Capacity Constraint	(0, 0)[96]	(2.79, 12.21)	(0, 15)	(0, 15)
Avoidable Cost, No Capacity Constraint	(0, 20)	(6, 14)	(0, 20)	(20, 0)
Unavoidable Cost, Capacity Constraint	(-5, 15)	(-8, 18)	(-20, 30)	(-20, 30)
Unavoidable Cost, No Capacity Constraint	(0, 20)	(0, 20)	(-20, 40)	(20, 0)

Table A.1: Cooperative Solutions in a Symmetric Example

These computations reveal several of the most relevant features of each solution that are also present in the non-symmetric cases presented in the following sections. For example, the "competitive" aspect of the core outcomes is clearly revealed by comparing the core outcomes with and without the capacity constraint. In both the avoidable and unavoidable cost cases, the core solution permits sellers to earn the entire surplus of trade in situations without a capacity constraint on buyer purchases. However, with a capacity constraint, sellers can do no better than to earn the minimal payoff. In other words, to the extent that Core outcomes are predictive of actual bargaining behavior between cable operators and cable networks, MVPDs might legitimately prefer the capacity constrained environment. For example, if we take as a reasonable prediction based on the Core the midpoint of the outcome favoring buyers and the outcome favoring sellers, then each buyer in the symmetric game receives a payoff of 30 in the constrained case and a payoff of 20 in the unconstrained case. (Sellers receive comparable payoffs of –20 and 0

[96] The Nash Bargaining Solution in the case of avoidable costs is computed under the assumption that players first bargain over the gross surplus from trade. If a seller's share of the surplus from all efficient trades exceeds his costs, then the costs *are* assumed to be sunk and the specified trades occur. Otherwise, the sellers choose to not incur the costs (which would result in a negative net profit) and so no trades occur. A different approach to the Nash Bargaining Solution in the case of avoidable costs has been developed by

respectively.) Thus, even though the total surplus available for distribution is higher in the *unconstrained* trading environment, buyers may expect to receive higher rewards when a constraint is imposed since the sellers are forced to compete **for** scarce slots in the latter situation.

Because Shapley values represent an average **of** incremental contributions to surplus over all possible coalitions, they mirror the above results but in a less extreme form. The Nash Bargaining Solution payoffs are similar to the Shapley value payoffs except that somewhat different trades are assumed in the computations.

Table **22** also demonstrates that treatments in which costs are viewed **as** avoidable guarantee that **sellers** receive non-negative payoffs under all circumstances, and in particular in the capacity constrained case. In contrast, with unavoidable costs and a capacity constraint, competition for scarce slots is so intense that sellers are never able to achieve a positive payoff under any of the three solution concepts.

In Sections **A.5.1** and **A.5.2** we further analyze the impact of varying our underlying treatment variables in the more interesting and realistic non-symmetric case which uses the same parameter values that are used in the experiments. **All** of the above conclusions continue to hold in the non-symmetric case, and some additional conclusions can be drawn based on the heterogeneity of both buyers and sellers.

A.4 Cooperative Solutions in the Non-Symmetric Bargaining Game

Tables **A.2** through **AS** present the three cooperative game theoretic solutions to the bargaining game between the cable operators and cable networks in **our** basic treatment variable in which the cable operator carries only three out **of** four available cable networks and the costs are unavoidable. The solutions are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the assumption that the participants behave in a manner consistent with the axioms or assumptions upon which each of the solutions is based.[97]

Alexander Raskovich [A. Raskovich (2001), "Pivotal Buyers and Bargaining Position," **U.S.** Department of Justice, Economic Analysis Group Discussion Paper 00-9].

[91] The bargaining outcomes show in Tables A.2-A.5 assume that both buyers and sellers enter the bargaining **game** with some previously incurred **costs. Thus,** buyers and sellas bargain over the **gross** surplus available from trade, and after all trades are conducted, the costs are subtracted. A discussion of the imponance of previously incurred **costs** is contained in Section **3.5.2.**

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	80	40	998	1926	1389	836	996	1531	857
High/ High	154	-39	997	1927	775	614	2944	417	857
High/ Low	94	25	991	1921	2224	2521			857

Table A.2: Nash Bargaining Solution Outcomes
(Capacity Constraint and Unavoidable Costs)

Under the Nash Bargaining solution, sellers (i.e., cable networks) vary substantially in the amount of surplus they obtain in the bargaining game. Regardless of the concentration environment, Seller #4 (the most popular cable network) obtains substantially more surplus than the other sellers. There is also substantial variation in the surplus earned by the buyers, since each cable operator is assumed to provide service to a different number of subscribers, and therefore generates different levels of advertising revenues. Interestingly, the amount of surplus earned by the sellers does not change with changes in the level of concentration on the buy side. In the Nash Bargaining Solution, the payoff to Buyer #5 (whose costs and values of trade are based on the DBS operator) remains unchanged with changes in market concentration.

Table A.3 presents the Shapley Value solutions to the bargaining game between the cable operators and cable networks where the cable operator carries only three out of four available cable networks. Again, the solutions are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the solutions assume that players behave in a manner consistent with the axioms upon which the Shapley Value is based.

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	**94**	112	**823**	1752	1458	**872**	1039	1600	**901**
High/ High	94	108	823	753	**814**	643	3076	432	901
High/ Low	**88**	**108**	**826**	1799	2345	2652			901

Table A.3: Shapley Value Solution Outcomes (Capacity Constraint and Unavoidable Costs)

Because the Shapley Value (which is always a single-valued outcome) does not embody the competitive pressures between sellers in quite the same way as the Core, it shows higher returns to the small sellers and lower returns to the larger sellers than the returns enjoyed by each set of sellers at the Core boundaries. Similar to the results obtained from the other solution concepts, sellers vary substantially in the amount of surplus they obtain in the bargaining game. Regardless of the concentration environment, Seller #4 (the most popular cable network) obtains substantially more surplus than the other sellers. There is also substantial variation in the surplus earned by the buyers.

Tables A.4 and A.5 identify the boundaries within which the set of Core payoffs reside.[98] Again, the solution values are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the solution values assume that players behave in a manner consistent with the assumptions upon which the Core is based. The upper bound represents an outcome where sellers obtain all the economic

[98] A transaction price divides the surplus generated from any trade between a buyer and a seller into two pieces. One piece is the surplus enjoyed by a buyer and the other piece is the surplus enjoyed by a seller. A seller obtains the entire surplus generated from a trade when the agreed to price is equal to the buyer's willingness to pay. A buyer obtains the entire surplus when the seller agrees to a price that is equal to the incremental cost it incurs from producing an additional unit of the item. In the current context, a cable operator obtains the entire surplus when the seller agrees to pay the cable operator a negative license fee that is equal to the seller's national advertising revenue.

surplus, while the lower bound represents an equilibrium outcome where buyers obtain all the economic surplus.[99]

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-158	-145	2481	6206	-107	-41	-174	-201	789
High/ High									
High/ Low			2496						

Table A.4: Core Solution Outcomes Favoring Sellers (Capacity Constraint and Unavoidable Costs)

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-176	-154	- 1357	-3225	3344	2009	2426	3731	2052
High/ High	-176	- 154	- 1357	-3225	1877	1466	7160	1001	2052
High/ Low	-176	-154	-1337	-3225	5391	6188			2052

Table A.5: Core Solution Outcomes Favoring Buyers (Capacity Constraint and Unavoidable Costs)

There are several results worth noting.'' As expected, the Core approach generates a very large set of possible bargaining outcomes. Similar to the results

[99] To be more precise, the solution outcomes favoring sellers are determined by solving a linear program that maximizes the (unweighted) sum of sellers' payoffs subject to the Core constraints. Similarly, the solutions favoring buyers are determined by solving a similar linear program that maximizes the sum of buyers' payoffs. Since the Core is a multidimensional set, great care should be exercised in interpreting these values. That is, small changes in the weights assigned to each individual player (i.e. seller or buyer) in each of the linear programs might result in somewhat different payoff outcomes. In a game with this number of players, a complete enumeration of Core outcomes is neither technically feasible, given currently available software, nor pedagogically desirable.

obtained using the Nash Bargaining solution and **the** Shapley value, buyers vary substantially in the amount of surplus they obtain in the bargaining game. There is also substantial variation in the surplus earned by the buyers. The largest buyers obtain the most surplus.

Sellers #1 and #2 lose money in all Core outcomes. **At** the boundary point that favors buyers, all sellers lose money. while at the boundary point that favors sellers, some buyers lose money. Surprisingly, the extent to which **sellers** lose money is independent of the degree of horizontal concentration among buyers.[101]

A.5 Altering the Bargaining Game

The bargaining outcomes predicted by the different solution concepts were based on a set of assumptions. These assumptions enter into the bargaining problem in the form of restrictions that may affect the predicted bargaining outcome. In an effort to obtain a better understanding of the causes of the predicted outcomes, we have relaxed two constraints. In the first instance. we relax the constraint that buyers cannot conduct a trade with every **seller.** In the second instance, we relax the constraint that both **sellers** and buyers must recover some previously incurred costs.

A.5.1 No Capacity Constraints

Because cable franchise areas typically do not overlap, each franchise area can be viewed by the cable network **as** a separate geographic market.[102] In addition, each franchise area typically contains a single cable operator and the cable operator's channel

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[100] Substantial care must be taken in evaluating Tables **8** and **9.** With the exception of Buyer #5 (i.e., the **DBS** operator), the market share accounted for by each buyer changes across treatments. This problem does not exist with sellers, given that their size remains constant across concentration treatments.

[101] In the Core outcomes favoring buyers, buyers capture the entire surplus from every possible trade, and so seller payoffs are the negative of their **fixed** costs. In the outcomes favoring sellers, competition between the two small sellers limits the surplus that either of these sellers can extract from any trade, resulting in negative profits. **As** noted in a previous footnote, the outcomes represented in Tables **A.4** and **A.5** represent only two extreme points out of many possible core outcomes.

[102] Some commenters in the *Further Notice* have speculated on the effect of multiple geographic markets on the flow of programming to viewers. For example, one commenter notes that a cable network may be able to walk away from an unfavorable deal in one market if it knows it can strike a favorable deal with cable operators **in** other markets (See Shelanski, pg. **7).** The example, however, assumes that the cable hetwork knows something about the quality of future trades. How does the cable network know that it can

capacity is **less** than the number of cable networks. Taken together, these conditions enable each cable operator to ration its channel capacity across a set of cable networks. To shed some light on the effect of this rationing on the welfare of buyers and sellers, it is instructive to compute a **set** of Core outcomes when there is no capacity constraint on **the** number of purchases made by each buyer.'" The results of this exercise are presented in the following tables.

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	713	726	3352	7077	-567	-338	-434	-669	-339
High/ High	712	717	3351	7078	-328	-239	1273	-167	-339
High/ Low	689	707	3299	6991	-905	1103			-339

Table A.6: Core Solution Outcomes Favoring Sellers
(No Capacity Constraints and Unavoidable Costs)

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-176	-154	-1357	-3225	3574	2129	2569	3961	2200
High/ High	-176	-154	-1357	-3225	2008	1563	7601	1052	2200
High/ Low	-176	-154	-1357	-3225	5731	6554			1966

Table A.7: Core Solution Outcomes Favoring Buyers
(No Capacity Constraints and Unavoidable Costs)

Just as in the symmetric market game presented in Section **A.3,** a comparison of Tables **A.4 – A.7** reveals that buyers may prefer the constrained trading environment to

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or cannot strike a favorable deal in other markets? what is it abut different geographic markets that permits a given cable network to strike a favorable **deal** in one market, but not in **another market?**